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acetic or butyric acid. The general result of the various cultures was that in the first case the sporelings developed normally; in the second, no sporelings appeared; while in the third, sporelings developed up to the 25-cell stage. The experiments were not carried farther. No cytological work was done. Since the *Fucus* plant is the $2x$ generation, it would be interesting to know the chromosome situation, especially if the plants should develop up to the reproductive phase.—CHARLES J. CHAMBERLAIN.

Chromosome conjugation.—Miss FRASER,[16] in a short discussion of chromosome conjugation, cites the work of OVERTON, HARPER, DIGBY, and others to show that it is not a matter of primary importance whether parasynapsis or telosynapsis takes place, and that they need not be mutually exclusive. The sexual nuclei may fuse at once upon fertilization, or not until the division of the oospore in other cases (Pinaceae); while in the extreme case of the rusts they remain distinct until just before meiosis. In like manner the attraction between the homologous chromosomes may bring about their conjugation as soon as the nuclei fuse, or in other cases later, even as late as the formation of the gemini of maturation. The suggestion is made that the clearest cases of Mendelian inheritance will perhaps be found to be those correlated with a late association of the chromosomes in pairs.—L. W. SHARP.

Flora of Boulder.—DANIELS[17] has made a study of the vascular flora of Boulder, Colo., and vicinity, a most interesting mountain region. An introduction (48 pp.) describes the physiography, the climate and rainfall, and the zones of vegetation. The zones given are Campestres, Mensales, Submontanae, Montanae, Subalpestres, and Alpestres, each with numerous subdivisions. The list of plants (211 pp.) includes 1225 numbers in 486 genera, with a statement as to the habitat of each species. A number of new combinations are made, and new species described in *Acomastylis* (*Geum*), *Prunus*, *Vitis*, *Castilleja*, and *Grindelia*. One of the unique features of the list is that a popular name is given for each species. When this reaches such a stage as "filiform toadflax-leaved painted cup," it is probable that it ceases to be useful.—J. M. C.

Graft hybrids.—Miss HUME[18] has investigated three graft hybrids for connecting protoplasmic threads. The "periclinal chimaeras" used were *Cytisus Adami*, *Solanum tubingense*, and *S. Kolereuterianum*, since in these the epidermis is the only layer of cells belonging to the one component, and the line of demarcation between the two components is therefore a sharp one. BUDER had already discovered connecting threads between the two components in *Cytisus Adami*, which Miss HUME confirmed. In *Solanum tubingense* she found them, while in the other *Solanum* she did not. These results show that genetically unrelated tissues can be joined by connecting threads, and the inference is that such threads do not arise from spindle fibers, since no nuclei of the two components have even been sisters.—J. M. C.

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[16] FRASER, H. C. I., The pairing of the chromosomes. New Phytol. **11**:58–60. 1912.

[17] DANIELS, FRANCIS POTTER, The flora of Boulder, Colorado, and vicinity. Univ. Missouri Studies. Science Series **2**: no. 2. pp. xiii+311. 1911.

[18] HUME, MARGARET, On the presence of connecting threads in graft hybrids. New Phytol. **12**:216–221. 1913.

The embryo sac of Bellis.—The peculiar development of the antipodal region in some Compositae has long been known. In 1895 the reviewer[19] described an "antipodal oosphere" in *Aster novae-angliae*, and nearly ten years later Miss OPPERMAN[20] not only found an antipodal oosphere in *Aster undulatus*, but noted its fertilization. Recently, CARANO[21] has described a "pseudo-oosphere" in the antipodal region of *Bellis perennis*. In all these cases, the region in which the abnormal oosphere is found is greatly enlarged; in fact, it has the appearance of an embryo sac. Doubtless the conditions in the enlarged antipodal cell are about the same as in a normal embryo sac, and consequently the occasional organization of an oosphere is not so strange as we formerly supposed.—CHARLES J. CHAMBERLAIN.

Reproduction in gymnosperms and angiosperms.—Under this title ERNST[22] gives an excellent résumé of the present status of the subject. The illustrations, which are taken from the leading contributions, are well reproduced. The bibliographies are in two categories: those which treat the subject in a general way, like textbooks, and those which deal with original investigation. The title, *Hand dictionary of the sciences*, is somewhat misleading for English-speaking people, for this "dictionary" is more like an encyclopedia, consisting of several volumes, edited by a staff of specialists. OLTMANNS is the general editor of botany, and he has distributed the various topics to specialists in the various fields. All articles, like the one just mentioned, are signed.—CHARLES J. CHAMBERLAIN.

Mitosis in Oenothera.—In the somatic divisions of *Oenothera lata* GATES[23] finds the chromosomes forming from the delicate reticulum by the parallel fusion of several strands. No prochromosomes are present, and no continuous spirem is formed. The splitting of the chromosomes occurs in late prophase,

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[19] CHAMBERLAIN, CHARLES J., The embryo sac of *Aster novae-angliae*. BOT. GAZ. **20**:205–212. *pls. 15, 16*. 1895.

[20] OPPERMAN, MARIE, A contribution to the life history of *Aster*. BOT. GAZ. **37**:353–362. *pls. 14, 15*. 1904.

[21] CARANO, ENRICO, Su particolari anomalie del sacco embrionale di *Bellis perennis*. Annali di Botanica **11**:435–439. *pl. 9*. 1913.

[22] ERNST, A., Fortpflanzung der Gymnospermen und Angiospermen. Abdruck aus Handwörterbuch der Naturwissenschaften **4**:227–261. *figs. 37*. 1913.

[23] GATES, R. R., Somatic mitosis in *Oenothera*. Ann. Botany **26**:993–1010. *pl. 86*. 1912.